PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-224616

(43)Date of publication of application : 21.08.1998

(51)Int.Cl. H04N 1/387
H04N 1/028
H04N 1/17

(21)Application number : 09-021751

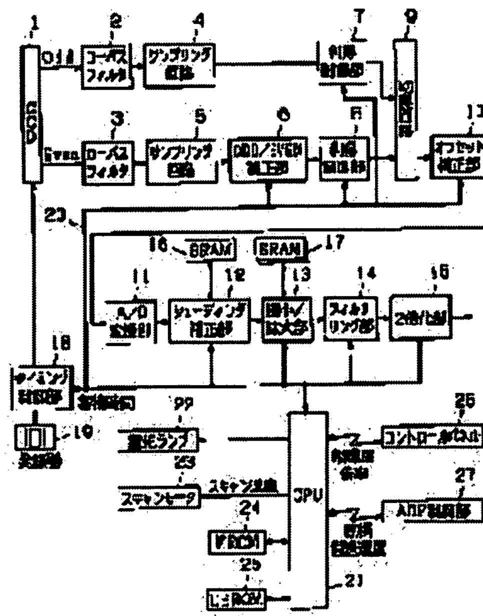
(22)Date of filing : 04.02.1997

(71)Applicant : FUJI XEROX CO LTD

(72)Inventor : HAMASUNA SHUNSUKE

(54) IMAGE READER

(57)Abstract:



PROBLEM TO BE SOLVED: To provide an image reader which reads an image in response to the setting of at least a resolution and from which an image with high image quality is obtained.

SOLUTION: A subscanning speed and a storage time of photoelectric conversion elements arranged in a CCD 1 are set according to a resolution and a magnification set by a control panel 26. The storage time is set to a timing control section 18 and the CCD 1 is driven. Furthermore, the subscanning speed is set to a scanning motor 23 or fed to an automatic draft feeder(ADF) control part 27 to control the movement of an original or an optical system. Thus, the subscanning in response to the resolution and the set magnification is conducted to sample the image. Since an output of the CCD 1 is changed by changing the storage time, the gain and the offset in response to the storage time are set to gain sections 7, 8, an ODD/EVEN correction section 6 and an offset correction section 10 in order to correct the output change.

LEGAL STATUS

[Date of request for examination] 14.09.1998

[Date of sending the examiner's decision of 20.06.2000

20

rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The image reader characterized by to have an image reading means to by_which the optoelectric transducer of a large number which change the image of a manuscript into an electrical signal was arranged, said manuscript and the migration means, to which said image reading means is moved relatively, the driving means that drive according to the storage time which had said optoelectric transducer in said image reading means set up, and the control means which set up the passing speed by said migration means, and said storage time according to resolution at least.
[Claim 2] It is the image reader according to claim 1 characterized by to have further a gain-control means amplify the electrical signal outputted from said optoelectric transducer on adjustable magnification level, and the offset control means which adjusts the offset level of the signal after magnification with this gain control means, and to set it up in quest of said magnification level of said gain-control means, and said offset level of said offset control means in case said control means performs a setup of said passing speed and said storage time according to resolution at least.
[Claim 3] A gain control means to amplify the electrical signal outputted from said optoelectric transducer on adjustable magnification level, It has further the offset control means which adjusts the offset level of the signal after magnification with this gain control means, and a storage means to memorize said magnification level and said offset level. Said control means The image reader according to claim 1 characterized by choosing said magnification level by which said storage means memorizes, and said offset level, and setting it as said gain control means and said offset control means with a setup of said passing speed and said storage time.
[Claim 4] Said magnification level to which said storage means memorizes, and said offset level are an image reader according to claim 3 characterized by asking for said every storage time set as a power up at least.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image reader which makes resolution adjustable especially about the image reader which reads a manuscript image using an optoelectric transducer.
[0002]
[Description of the Prior Art] The image reader is realized as the input parts of a copying machine or facsimile apparatus, or an image scanner connected to the computer or the network. It has various kinds of reading modes, and such image readers are consisted of by the user selectable. There are selection of resolution, a setup of a scale factor, etc. as one of the reading modes.
[0003] As an approach of changing resolution in the conventional image reader, as shown, for example in JP,4-369163,A, what changes resolution of the direction of vertical scanning in modification of the bearer rate of a manuscript and the combination of the number of infanticide of Rhine is known. Moreover, the approach modification of the resolution of a main scanning direction generally thins out a pixel is used. However, the case which cannot perform modification of resolution only with such a technique has come out by the demand to the improvement in the speed to an image reader in recent years, and high-resolution-izing, and it waits for development of the technique which fills such a demand.
[0004] Drawing 9 is the explanatory view showing an example of the relation between the resolution in the conventional image reader, a setting scale factor and a vertical-scanning rate, and interpolation Rhine. In this example, resolution shall be made selectable from the three-stage of 400SPIs, 200SPI, and 100SPI, and a scale factor shall be set up in the range from 50% to 400%. A vertical-scanning rate is the bearer rate of a manuscript, or the passing speed of an optoelectric transducer.
[0005] For example, the mode 2 is resolution 400SPI and shows that a vertical-scanning rate is changed according to 50% - 400% of setting scale factors. That is, a vertical-scanning rate is accelerated, the number of samplings is reduced, so that a setting scale factor is close to 50%, and an image is reduced. Moreover, low-speed-ize a vertical-scanning rate and the number of samplings is made to increase, so that a setting scale factor is close to 400%, and an image is expanded.
[0006] If resolution is set as half 200SPIs, as shown as the mode 3, a vertical-scanning rate will be made into twice [according to a setting scale factor] a rate, the number of samplings of the direction of vertical scanning will be made into one half, and resolution will be reduced. However, there is a limitation in improvement in the speed, and 100% of 100SPIs also of a vertical-scanning rate are limits in this example. While doubling a vertical-scanning rate instead of increasing a vertical-scanning rate 4 times when a setting scale factor is smaller than 100% of 100SPI as shown in the mode 5, interpolation of two lines is taken, or one line is thinned out, the number of Rhine is decreased, and it corresponds.
[0007] In addition, in this example, in the mode 5, an optoelectric transducer is moved from the mode 2, vertical scanning is performed, in the mode 11, a manuscript is conveyed from the mode 6, and vertical scanning is performed. The capacity of the motor used in order to convey manuscripts, such as ADF (automatic feeding equipment), generally is low, and the bearer rate of a manuscript is slow. Therefore,

from the mode 6 in which a manuscript is conveyed compared with the mode 5 from the mode 2 to which an optoelectric transducer is moved, in the mode 11, the limitation of a vertical-scanning rate is low, therefore in case it is a low resolution and a low scale factor, it depends on interpolation processing.

[0008] In such a conventional image reader, while changing a vertical-scanning rate according to the resolution and the setting scale factor which are set up as shown in drawing 9 , by infanticide or interpolation processing, the number of Rhine is decreased and it corresponds. However, by infanticide processing, degradation of image quality is intense and there is a problem of having to make memory memorize 1 thru/or the image for two or more lines read previously by interpolation processing. The memory for interpolation had become the cause of a cost rise of an image reader. Moreover, it is desirable to deal with modification of resolution and a scale factor by sampling, without performing such infanticide processing and interpolation processing also for the improvement in image quality.
[0009] On the other hand, as a technique relevant to this invention, in a television camera, the storage time of a solid state image sensor is changed into JP,7-36616,B, and there are some which realized both the mode which lessens dotage when picturizing a mobile, and the mode which lessens effect of the flicker by a fluorescent lamp etc. in it. Moreover, although the signal level outputted from a solid state image sensor will change if the storage time of a solid state image sensor is changed, by this reference, signal level is fixed by carrying out adjustable [of a diaphragm of a lens and the gain of an analog amplifying circuit]. However, in such signal processing, since the offset value of an analog amplifying circuit also changes at the time of signal gain modification, there is a problem of the black level of a signal changing, and concentration being before and after storage-time modification, and changing. Moreover, by this reference, it is not suggested at all about making modification of the storage time and a change of other signal level to modification of resolution. Furthermore, in an image reader, a manuscript is illuminated with an exposure lamp. What is necessary is for there to be also aging, such as degradation of an exposure lamp, and just not to set up signal gain, an offset value, etc. which are set up at the time of modification of the storage time at the time of shipment, and it is necessary to calculate a value in predetermined timing at this time.
[0010]
[Problem(s) to be Solved by the Invention] Without having been made in view of the situation mentioned above, and performing infanticide and interpolation processing of Rhine, this invention reads an image according to a setup of resolution at least, and aims at offering the image reader which can obtain a high-definition image.
[0011]
[Means for Solving the Problem] An image reading means by which the optoelectric transducer of a large number which, as for invention according to claim 1, change the image of a manuscript into an electrical signal in an image reader was arranged, Said manuscript, the migration means to which said image reading means is moved relatively, and the driving means driven according to the storage time which had said optoelectric transducer in said image reading means set up, It is characterized by having the control means which sets up the passing speed by said migration means, and said storage time according to resolution at least.
[0012] Invention according to claim 2 is set to an image reader according to claim 1. A gain control means to amplify the electrical signal outputted from said optoelectric transducer on adjustable magnification level, It has further the offset control means which adjusts the offset level of the signal after magnification with this gain control means. Said control means In case a setup of said passing speed and said storage time is performed according to resolution at least, it is characterized by setting up in quest of said magnification level of said gain control means, and said offset level of said offset control means.
[0013] Invention according to claim 3 is set to an image reader according to claim 1. A gain control means to amplify the electrical signal outputted from said optoelectric transducer on adjustable magnification level, It has further the offset control means which adjusts the offset level of the signal after magnification with this gain control means, and a storage means to memorize said magnification

level and said offset level. Said control means It is characterized by choosing said magnification level by which said storage means memorizes, and said offset level, and setting it as said gain control means and said offset control means with a setup of said passing speed and said storage time.
[0014] Said magnification level to which said storage means memorizes invention according to claim 4 in an image reader according to claim 3, and said offset level are characterized by asking for said every storage time set as a power up at least.
[0015]
[Embodiment of the Invention] The main block diagram in which drawing 1 shows one gestalt of operation of the image reader of this invention, and drawing 2 are the sectional views showing main structures similarly. One among drawing a low pass filter, and 4 and 5 for CCD, and 2 and 3 A sampling circuit, 6 the gain control section and 9 for the ODD/EVEN amendment section, and 7 and 8 A change-over circuit, 10 an A/D converter and 12 for the offset amendment section and 11 The shading compensation section, In 13, contraction/limb, and 14 the binary-ized section, and 16 and 17 for the filtering section and 15 Memory, In 18, a timing control section and 19 a bus and 21 for an oscillator and 20 CPU, In 22, an exposure lamp and 23 FROM and 25 for a scanning motor and 24 EEROM, 26 -- a control panel and 27 -- an ADF control section and 31 -- a platen and 32 -- a mirror group and 33 -- for ADF and 36, as for a white plate and 38, a conveyance roll and 37 are [a lens and 34 / a manuscript tray and 35 / a substrate and 39] host computers. In addition, many parts shown in drawing 1 are prepared on the substrate 38 in drawing 2 . Moreover, a host computer 39 is connected suitably.
[0016] With the gestalt of this operation, a manuscript is laid in a platen 31 or the manuscript tray 34. The manuscript laid on the platen 31 is scanned by migration of the exposure lamp 22 and a mirror group in the direction of vertical scanning. Moreover, the manuscript laid in the manuscript tray 34 is incorporated by ADF35, and is conveyed with the conveyance roll 36. At this time, the exposure lamp 22 shown in drawing 2 and the manuscript conveyed in the location of the mirror group 32 are read. The white plate 37 is for offering the white which serves as criteria at the time of adjustment of each part shown in drawing 1 . In addition, the two approaches of reading shown in drawing 2 are examples, and can constitute the image formation equipment which carried suitably various approaches, such as either, and the approach of making move the exposure lamp 22 and the mirror group 32, and scanning after ADF conveys a manuscript to a platen, a method of moving a manuscript the whole platen.
[0017] The exposure lamp 22 illuminates a manuscript and carries out image formation of the image on a manuscript on CCD1 through the mirror group 32 and a lens 33. CCD1 is the so-called line sensor, many optoelectric transducers are arranged in the main scanning direction, and the optical signal which carried out incidence is changed into an electrical signal. Here, CCD1 has two output ports, the sequential output of the signal from the odd-numbered optoelectric transducer is carried out at one side, and the sequential output of the signal from the even-numbered optoelectric transducer is carried out in another side.
[0018] Low pass filters 2 and 3 remove an unnecessary high frequency component from the electrical signal outputted from CCD1. Sampling circuits 4 and 5 extract a picture signal from an electrical signal. The ODD/EVEN amendment section 6 amends the difference in the property of the odd-numbered signal and the even-numbered signal which are outputted from CCD1. Amendment which makes the level difference of offset of both especially in agreement is performed. The gain control sections 7 and 8 amplify an electrical signal until an electrical signal serves as the range of a reference value. The change-over circuit 9 makes sequential selection of the odd-numbered signal from CCD1, and the even-numbered signal, and rearranges them into the signal of the single tier of a main scanning direction. The offset amendment section 10 amends offset of an electrical signal, and adjusts especially black level. A/D converter 11 changes the electrical signal of an analog into digital data.
[0019] The shading compensation section 12 amends the exposure lamp 22, limb darkening by lens 33 grade, the difference in the property of each optoelectric transducer of CCD1, etc. Contraction / limb 13 performs contraction or expansion processing of the image of a main scanning direction. The filtering section 14 performs digital filter processing, and performs various kinds of image processings. Moreover, natural complexion removal processing etc. is performed. The binary-ized section 15 changes

the digital data of a multiple value into binary data. In expressing halftone in that case, it makes it binary by false halftone processing of a dither method etc. Moreover, what is necessary is just to make it binary by threshold processing, for example in the alphabetic character section. Thus, the data made binary are outputted to an output unit, facsimile or a host computer 39, a network, etc.
[0020] The timing control section 18 outputs the clock which counts the clock which an oscillator 19 generates and drives CCD1 according to the storage time set up. Moreover, supply of a timing signal of operation is also performed to drawing 1 and each part shown in 2.
[0021] CPU21 operates according to the program stored in FROM (Flash ROM)24, and performs various kinds of control. CPU21 sets [to the ODD/EVEN amendment section 6 / the amount of amendments / to the gain control sections 7 and 8 / gain / an offset value] up the storage time of CCD1 for a setup of a parameter and control of operation required for each actuation to the timing control section 18 to the shading compensation section 12, the contraction/limb 13, the filtering section 14, and the binary-ized section 15 to the offset amendment section 10 further, respectively. These are connected by the bus 20. Moreover, while controlling lighting/putting out lights to the exposure lamp 22 and controlling the actuation to a scanning motor, scan speed is set up, and the bearer rate of a manuscript is transmitted to the ADF control section 27. Furthermore, while communicating between control panels 26 and acquiring various kinds of set points, outputs, such as a message to an operator and a condition of a device, are requested. Although not illustrated, in addition to this, CPU21 is connected with various kinds of sensors, an interface, etc.
[0022] The exposure lamp 22 illuminates a manuscript. According to the scan speed set up from CPU21, the scanning motor 23 moves the exposure lamp 22 and the mirror group 32, and scans the direction of vertical scanning. In EEROM25, the gain set as the gain control section corresponding to the storage time of CCD1, the offset value set as the offset amendment section 10 are held. A control panel 26 is an interface for an operator performing various kinds of setup, and displaying a condition, a message, etc. of equipment. Resolution, a scale factor, etc. can be set up at least. Of course, it may be set up from a host computer 39 etc. The ADF control section 27 controls actuation of ADF35 and the conveyance roll 36 in it. Here, the conveyance roll 36 is operated according to the bearer rate set up from CPU21.
[0023] If an operator inputs resolution and a scale factor from a control panel 26, the resolution and the scale factor which were inputted will be sent to CPU21. The storage time of CCD1 and the rate of the direction of vertical scanning are found by any of whether the manuscript on the information and the selected input approach 31, i.e., a platen, is read, or to read, making a manuscript convey using ADF35 CPUs21 are. And the found storage time is set as the timing control section 18. The timing control section 18 carries out drive control of CCD1 according to the set-up storage time. Moreover, it is made to move at the rate which the rate of the direction of vertical scanning was set [rate] up to the scanning motor 23 according to the selected input approach when reading the manuscript on a platen 31, and had the exposure lamp 22 and the mirror group 32 set up, and vertical scanning is performed. In using ADF35, it sends the rate of the direction of vertical scanning searched for to the ADF control section 27. The ADF control section 27 is conveyed with the conveyance roll 36 at the rate which had the manuscript on the manuscript tray 24 set up.
[0024] Drawing 3 is the explanatory view showing an example of the relation between the resolution in one gestalt of operation of the image reader of this invention, a setting scale factor and a vertical-scanning rate, and interpolation Rhine. 600SPIs are made possible as resolution here, and it is based on the setup at the time of these 600SPIs. For example, in above-mentioned drawing 9 , the storage time is constant value and was performing interpolation between Rhine. In this invention, the storage time is changed according to resolution and a setting scale factor. With it, interpolation processing between Rhine is omitted by becoming unnecessary.
[0025] In the example shown in drawing 3 , most, the storage time of CCD1 is min, and the storage time at the time of 600SPIs of high resolution makes the storage time at this time the minimum storage time T, and loads [from] it to the timing control section 18 alternatively in five kinds of 1.5T/2T / 3T/6T.
[0026] The modes 1-5 are the modes using the reading approach of laying a manuscript in a platen 31, moving the exposure lamp 22 and the mirror group 32, and performing vertical scanning. In this case, as

shown in the mode 1, resolution 600SPI is realized. The storage time at this time is T, and a vertical-scanning rate is set as the rate according to a setting scale factor. For example, on the basis of 100% of setting scale factors, at 200%, at one half of rates, and 400%, it is set as one fourth of rates, and is set as a twice as many rate as this by 50%.

[0027] In the mode 2, since resolution is 400SPIs and is 2/3 of 600SPI, the storage time is set to 1.5T and the vertical-scanning rate is made into the rate which followed the setting scale factor like the mode 1. In the modes 3 and 4 in which resolution is 200SPIs and 100SPI, the storage time is set to 1.5T and it corresponds as the twice of a rate which followed the setting scale factor in the vertical-scanning rate, and 4 times.

[0028] In the mode 5, since the scale factor is smaller than 100% at 100SPI, a high-speed vertical-scanning rate is further required rather than the mode 4. For example, if based on 400SPIs and the vertical-scanning rate at the time of 100%, one 8 times the rate of this will be required 100SPI and 50% at o'clock. However, since the scanning motor 23 needs to be enlarged etc., improvement in the speed of the vertical-scanning rate of 4 times or more is not performed here. Moreover, although drawing 9 was conventionally supported by interpolation processing as shown, in this invention, it corresponds by lengthening the storage time. In this example, the storage time is set as 3T and the vertical-scanning rate is made into twice [according to a setting scale factor] the rate. Thereby, it is a vertical-scanning rate at the 100SPI and 50% contraction time, and it becomes 400SPIs and 4 times at the time of 100%. In addition, in the case of this mode, interpolation processing is not performed.

[0029] The modes 6-11 are the modes in which ADF35 is used. In many cases, ADF35 is attached in closing motion covering, and small and a lightweight thing are desired. Therefore, the motor which drives the drive roll 36 of ADF35 has the weak force compared with the motor which drives the exposure lamp 22 attached in the body, and the mirror group 32, and cannot convey a high-speed manuscript. Here, the motor of ADF35 shall convey the manuscript only to the twice as many rate as this 400SPI and on the basis of 100%.

[0030] Resolution can read by the same setup as the mode 2 in the mode 6 of 400SPIs. When resolution is 200SPIs, a setting scale factor is good at the setup same in 100% or more of mode 7 as the mode 3. However, since the bearer rate of a manuscript becomes quick too much when a setting scale factor is less than 100%, the storage time of CCD1 is set as 3T, and the vertical-scanning rate is made into the rate according to a setting scale factor. Thereby, even when resolution is 200SPIs and a scale factor is 50%, the bearer rate of a manuscript becomes the twice 400SPIs and on the basis of 100%.

[0031] When resolution is 100SPIs, a setting scale factor can read by the same setup as the mode 4 in 200% or more of mode 9. However, since the bearer rate of a manuscript becomes quick too much with a scale factor 4 times the rate of a setting at 100% - 199%, like the above-mentioned mode 5, the storage time is set as 3T and the vertical-scanning rate is made into twice [according to a setting scale factor] the rate. Furthermore, at less than 100%, the storage time is set as 6T and the vertical-scanning rate is made into the rate according to a setting scale factor.

[0032] The modes 12-14 are the modes in the case of outputting the image read to the host computer 39. Generally the transfer rate to a host computer 39 and the storing rate to memory are slower than the reading rate of an image reader. Therefore, in the case of resolution 600SPI in the mode 12, the vertical-scanning rate was set to one third of the rates according to a setting scale factor, and the storage time was set as 3T, and it has set up, for example so that it may read over 3 times as much time amount as the mode 1. Moreover, while a host computer 39 shall be incorporated by the usual reading rate at 400SPIs and 300SPI and resolution makes a vertical-scanning rate the rate according to a setting scale factor, the storage time is changed into 1.5T and 2T, respectively.

[0033] Thus, the image according to various resolution, a setting scale factor, the reading approach, and an output method can be read by setting up a vertical-scanning rate and the storage time according to resolution and a setting scale factor. Since interpolation processing like before is omitted at this time, the memory for holding 1 thru/or the image data for several lines already read is unnecessary. Moreover, since interpolation processing is omitted in the direction of vertical scanning, it cannot be based on various resolution and a scale factor, but the image of good image quality can be obtained.

[0034] Thus, when the storage time of CCD1 is changed according to resolution and a scale factor, the magnitude of the electrical signal outputted from CCD1 changes. That is, the optoelectric transducer of CCD1 generates and outputs the electrical signal according to the quantity of light irradiated in the storage time. Even when the light of the same quantity of light is always irradiated, the electrical signal according to the die length of the storage time will occur. However, when the same manuscript is inputted, it is not based on the die length of such the storage time, but, in the case of any storage times, uniform image data must be outputted. Therefore, it is necessary to change the gain set as the gain control sections 7 and 8 according to each storage time, and the offset value set as the offset amendment section 10.
[0035] For example, the magnitude of the signal which will be outputted from CCD1 if the storage time becomes short becomes small, and it is **. Therefore, gain in the gain control sections 7 and 8 is enlarged, and is amplified. What is necessary is just to amend so that offset may be lowered in the offset amendment section 10 since the signal output in the condition that there is no light at this time will also be amplified by coincidence. What is necessary is to make gain small conversely, when the storage time becomes long, and just to amend so that offset may be raised.
[0036] The gain and the offset value according to such the storage time can be measured beforehand, for example, and can be stored in ROM etc. However, according to secular change of the exposure lamp 22 etc., since the output from CCD1 changes gradually, for example, when these values are determined at the time of shipment, it has the case where it becomes impossible to perform proper signal processing gradually. Therefore, whenever the power source of an image reader is switched on, for example, these values can be measured, and it can constitute so that signal processing according to the equipment property at that time may be performed.
[0037] In the above-mentioned example of a configuration, if it is stored in EEROM25 and resolution and a scale factor are set up with a control panel 26, the gain and the offset value according to the storage time take out the gain and the offset value according to the resolution and the scale factor which were set up from EEROM25, and load them to the gain control sections 7 and 8 and the offset amendment section 10. In addition, in this example, it has set up also about the amount of amendments of the ODD/EVEN amendment section 6 according to the storage time.
[0038] Drawing 4 is a flow chart which shows an example of actuation of the whole equipment in one gestalt of operation of the image reader of this invention. An injection of the power source of an image reader sets up the storage time in the mode 1 first shown in drawing 3 as the default storage time in S41. Moreover, a default is set as each part shown in drawing 1 .
[0039] In S42, the gain set as the gain control sections 7 and 8 according to each storage time is measured. Moreover, in S43, the offset value set as the ODD/EVEN amendment section 6 according to each storage time is measured. Furthermore in S44, the offset value set as the offset amendment section 10 according to each storage time is measured. Such measured value is stored in EEROM25. Termination of these measurement loads and sets the set point in the mode 1 which is the default mode as each part in S45. Next, shading data are extracted in S46 and it stores in memory 16. The processing at the time of a power source ON is completed now.
[0040] In S47, it stands by until a start button is pushed. A push on a start button judges the mode set up with the control panel 26 etc. in S48. Resolution, a setting scale factor, etc. are contained in the mode set up. Moreover, the reading approach may be set up. By a sensor etc., the reading approach may detect the location where the manuscript is set, and may be set up. In S49, the storage time of CCD1 according to the mode set up is acquired, and it is set as the timing control section 18. Moreover, in S50, the gain and the offset value according to the mode set up are taken out from EEROM25, and it loads and sets to the gain control sections 7 and 8, the ODD/EVEN amendment section 6, the offset amendment section 10, etc.
[0041] And reading of the image on a manuscript is started. When the manuscript is laid on the platen 31, it reads moving the exposure lamp 22 and the mirror group 32 by the scanning motor 23 at the resolution set up or the vertical-scanning rate according to a setting scale factor. CCD1 is driven by the timing control section 18 according to the set-up storage time. Each optoelectric transducer of CCD1

changes and outputs the light income within the storage time to an electrical signal. this time -- in the odd-numbered optoelectric transducer, an electrical signal is carried out to a low pass filter 2, and the even-numbered optoelectric transducer carries out the sequential output of the electrical signal to a low pass filter 3.
[0042] An unnecessary high frequency component is removed by low pass filters 2 and 3, and, as for the electrical signal outputted from CCD1, a picture signal is extracted in sampling circuits 4 and 5. In the ODD/EVEN amendment section 6, amendment of offset is made by the picture signal sampled in the sampling circuit 5 so that it may become offset equivalent to the picture signal sampled in the sampling circuit 4. The picture signal sampled in the sampling circuit 4 and the picture signal amended in the ODD/EVEN amendment section 6 are amplified according to the gain set up in the gain control sections 7 and 8, respectively. The output of the gain control sections 7 and 8 is chosen by turns in the change-over circuit 9, is made into the picture signal of one train, performs offset amendment according to the offset value set up in the offset amendment section 10, and adjusts black level.
[0043] The picture signal of an analog with which these adjustments were performed is changed into digital data by A/D converter 11, and a shading compensation is performed in the shading compensation section 12. Although it has the number of Rhine according to the resolution and the scale factor which are set up about the direction of vertical scanning by reading by a vertical-scanning rate and the storage time as shown in drawing 3 , about a main scanning direction, it is still the resolution of CCD1. Therefore, contraction or expansion processing of the image of a main scanning direction is performed by contraction / limb 13. Then, the filtering section 14 changes and outputs the digital data of a multiple value to binary data in the binary-ized section 15, after performing image processings, such as digital filter processing.
[0044] Drawing 5 is a flow chart which shows an example of actuation of the gain setting in one gestalt of operation of the image reader of this invention. Here, the measurement actuation of gain performed in S42 of drawing 4 is explained. First, while turning on the exposure lamp 22 in S61, it moves to the location of the white plate 37 which shows a reading station to drawing 2 . This white plate 37 serves as white criteria, and is formed outside the reading field of a manuscript. The variable N which sets to 1 the variable n which furthermore shows either of five kinds of storage times of the classification of the storage time, i.e., T, and 1.5T, 2T, 3T and 6T, and shows the count of trial is set to 0.
[0045] The image for one line is read in S62, and the wave is stored in memory 16. that is, it is based on the white plate 37 -- a white image is read altogether. And the maximum Xmax in it is calculated in S63. In S64, the maximum Xmax obtained by S63 judges whether it is predetermined within the limits. Here, when desired value is set to Xo and it is within the limits of 0.8Xo to 1.2Xo(es) as an example, it judges with that from which the gain which should be set up was acquired. When not going into this range, it judges whether the count of trial became the count of predetermined in S65. Here, an error message is performed when the maximum of a signal does not become predetermined within the limits, even if N is set to 5.
[0046] When retrying, the gain GC according to each optoelectric transducer (i) is amended based on Ga which asked for the ratio of Maximum Xmax and desired value Xo, i.e., Ga=Xo/Xmax, in S66, and was calculated by S66 in S67. For example, GC (i) can be calculated by GC(i) =GC(i)+(20logGa)+0.092. Of course, the formula for this amendment is an example and can be amended to arbitration. In S68, the gain GC (i) searched for by S67 is loaded to the gain control sections 7 and 8. And only 1 makes the count N of trial increase by S69, it returns to S62, and an image is captured again.
[0047] When the maximum Xmax of the image read by S64 is predetermined within the limits, the gain GC (i) on which the gain set as the gain control sections 7 and 8 was set up in S70 as the right thing at this time is matched with the storage time, and it saves at EEROM25. And that gain should be measured about the following storage time, only 1 makes the variable n which shows the class of storage time by S71 increase, after judging whether measurement was completed about five kinds of storage times in S72, when all having not ended, it returns to S62 and the measurement about the new storage time is continued. About five kinds of storage times, if gain is acquired, respectively, processing of a gain setting will be ended.

[0048] Drawing 6 and drawing 7 are flow charts which show an example of measurement actuation of the offset value set as the ODD/EVEN amendment section in one gestalt of operation of the image reader of this invention. Here, the measurement actuation of the offset value set as the ODD/EVEN amendment section 6 according to each storage time performed in S43 of drawing 4 is explained. In S81, the exposure lamp 22 is switched off and the gain measured by S42 is loaded to the gain control sections 7 and 8. The gain to load sets to 1 the variable n which shows the classification of the storage time as initial setting, and makes it the gain corresponding to this storage time. Moreover, the variable N which shows the count of trial is set to 0.
[0049] In S82, 0 is set to the ODD/EVEN amendment section 6 as an offset value, the wave for one line is incorporated, and it stores in memory 17. At this time, it does not store in memory 16 so that the shading compensation section 12 may not malfunction, but memory 17 is used. In S83, the pixel stored in the even address of the image data stored in memory 17 presupposes that it is outputted from the even-numbered optoelectric transducer of CCD1, and the pixel stored in the odd address assumes that it is outputted from the odd-numbered optoelectric transducer of CCD1. Whether this assumption was right judges by S86. moreover -- S83 -- the average EVENave of the average ODDave of the value of an odd address, and the value of an even address -- calculating -- the difference -- (00) =ODDave-EVENave is calculated.
[0050] In S84, FF (hexadecimal) which is the biggest value is shortly set to the ODD/EVEN amendment section 6 as an offset value, the wave for one line is incorporated, and it stores in memory 17. and the average EVENave of the average ODDave of the value stored in the odd address of memory 17 in S85, and the value stored in the even address -- calculating -- the difference -- (FF) =ODDave-EVENave is calculated.
[0051] It sets to S86 and is difference (00). - The value of difference (FF) is inspected. Since the value of EVENave calculated in S85 will become large if the assumption in S83 is right, difference (FF) serves as a value of minus, and it is difference (00). - Difference (FF) is added. Conversely, if the assumption of S83 is an error, since the value of ODDave calculated in S85 will become large and the difference (FF) will serve as a big positive number, it is difference (00). - The value of difference (FF) is subtracted. Therefore, difference (00) - when the value of difference (FF) is minus The pixel stored in the even address of the image data which the assumption of S83 stored in memory 17 in S87 as what was an error It supposes that it is outputted from the odd-numbered optoelectric transducer of CCD1, and the pixel stored in the odd address determines that it is outputted from the even-numbered optoelectric transducer of CCD1. Difference (00) - If the value of difference (FF) is plus, it will move from the assumption of S83 to the following processings as the right thing.
[0052] In S88, a default is set to the ODD/EVEN amendment section 6 as an offset value. Moreover, in S89, the gain GC corresponding to the variable n which shows the classification of the storage time (n) is loaded to the gain control sections 7 and 8. In such a setup, the wave for one line is incorporated in memory 17 by S90, and the average ODDave of the odd-numbered pixel and the average EVENave of the even-numbered pixel are calculated. And in S92, the difference of ODDave and EVENave is searched for and a difference judges whether it is predetermined within the limits. Here, it has judged whether the absolute value of a difference is 0.5 or less. This threshold can be set as arbitration.
[0053] the judgment in S92 -- predetermined -- when out of range, it is shown that the offset value set as the current ODD/EVEN amendment section 6 is not proper. Therefore, an offset value is corrected. First, when the value of the variable N which shows the count of trial in S93 amounts to 10, trial is closed as what did not become a proper value even if it corrected the offset value, and an error message is performed. In count within the limits of trial, in S94, the offset value AOC1 according to each optoelectric transducer by which a current setup is carried out (i) is amended using the value of ODDave and EVENave which were calculated by S91. For example, AOC1 (i) is AOC1(i) =85.4(ODDave-EVENave)+AOC1 (i).
It can come out and ask. Of course, the formula for this amendment is an example and can be amended to arbitration. In S95, the offset value AOC1 (i) amended by S94 is loaded to the ODD/EVEN amendment section 6. And only 1 makes the count N of trial increase by S96, it returns to S90, and an

image is captured again.
[0054] When the value of the absolute value of ODDave-EVENave is below a predetermined value in S92, the offset value AOC1 (i) with which the offset value set as the ODD/EVEN amendment section 6 was set up in S97 as the right thing at this time is matched with the storage time, and it saves at EEROM25. And that gain should be measured about the following storage time, only 1 makes the variable n which shows the class of storage time by S98 increase, after judging whether measurement was completed about five kinds of storage times in S99, when all having not ended, it returns to S89 and the measurement about the new storage time is continued. If the offset value for setting it as the ODD/EVEN amendment section 6, respectively is acquired about five kinds of storage times, measurement processing of an offset value will be ended.
[0055] Drawing 8 is a flow chart which shows an example of measurement actuation of the offset value set as the offset amendment section in one gestalt of operation of the image reader of this invention. Here, the measurement actuation of the offset value set as the offset amendment section 10 according to each storage time performed in S44 of drawing 4 is explained. In S101, the exposure lamp 22 is switched off and a default is loaded to the offset amendment section 10 as an offset value. Moreover, the variable n which shows the classification of the storage time as initial setting is set to 1, and the variable N which shows the count of trial is set to 0.
[0056] In S102, the gain GC corresponding to the variable n which shows the classification of the storage time (n) is loaded to the gain control sections 7 and 8. Moreover, the offset value AOC1 corresponding to Variable n (n) is loaded to the ODD/EVEN amendment section 6. In such a setup, the wave for one line is incorporated in memory 17 by S103. And the average Xave of an effective pixel is calculated in S104. In S105, the average Xave calculated by S104 judges whether it is predetermined within the limits. Here, it has judged whether it is within the limits of desired value Xo**1 of an offset value. This threshold can be set as arbitration.
[0057] the judgment in S105 -- predetermined -- when out of range, it is shown that the offset value set as the current offset amendment section 10 is not proper. Therefore, an offset value is corrected. First, when the value of the variable N which shows the count of trial in S106 amounts to 10, trial is closed as what did not become a proper value even if it corrected the offset value, and an error message is performed. In count within the limits of trial, in S107, the offset value AOC2 according to each optoelectric transducer by which a current setup is carried out (i) is amended using the value of the average Xave calculated by S104, and desired value Xo. For example, AOC2 (i) is AOC2(i) =10.1 (Xave-Xo)+AOC2 (i).
It can come out and ask. Of course, the formula for this amendment is an example and can be amended to arbitration. In S108, the offset value AOC2 (i) amended by S107 is loaded to the offset amendment section 10. And only 1 makes the count N of trial increase by S109, it returns to S103, and an image is captured again.
[0058] When the average Xave is predetermined within the limits in S105, the offset value AOC2 (i) with which the offset value set as the offset amendment section 10 was set up in S110 as the right thing at this time is matched with the storage time, and it saves at EEROM25. And that gain should be measured about the following storage time, only 1 makes the variable n which shows the class of storage time by S111 increase, after judging whether measurement was completed about five kinds of storage times in S112, when all having not ended, it returns to S102 and the measurement about the new storage time is continued. If the offset value for setting it as the offset amendment section 10, respectively is acquired about five kinds of storage times, measurement processing of an offset value will be ended.
[0059] Thus, the gain set as the gain control sections 7 and 8 called for by processing shown in drawing 5 - drawing 8 , the offset value set as the ODD/EVEN amendment section 6, and the offset value set as the offset control section 10 are matched with the storage time, and is stored in EEROM25. As shown in drawing 4 , in case an image is actually read, the storage time according to the resolution and the scale factor which are set up is set up, and the gain and the offset value corresponding to the set-up storage time are loaded to the gain control sections 7 and 8, the ODD/EVEN amendment section 6, and the offset control section 10, respectively. Although the electrical signal outputted from CCD1 will change

if the storage time is changed with a vertical-scanning rate according to resolution and a setting scale factor as mentioned above, by changing gain and an offset value in this way, it cannot be based on the storage time but a good output can be obtained from an image reader.
[0060] In the example shown in drawing 4 , the power up was asked for the gain and the offset value according to the storage time of CCD1, and they were stored in EEROM25. Since gain and an offset value are loaded to the gain control sections 7 and 8, the ODD/EVEN amendment section 6, and the offset control section 10 by this according to the mode at the time of image reading mode selection, image reading start time is not delayed.
[0061] However, according to the storage time determined from the resolution and the setting scale factor after modification whenever not only this but resolution and a setting scale factor are changed, this invention may calculate gain and an offset value and may be set up. Detection of modification of resolution or a setting scale factor can be performed to various timing, such as comparing with the last set point, or directing to CPU21, when a start button is pushed and predetermined time progress is carried out after setting modification with a control panel 26. Moreover, even if it does not form EEROM25 holding the group of these values, it can constitute from a configuration which calculates gain and an offset value in this way at the time of modification of resolution or a setting scale factor. Furthermore, neither resolution nor a setting scale factor may be changed, or a setup of gain or an offset value may be performed for every batch initiation of image reading, and it can respond also to a change of an exposure lamp or CCD with time in that case.
[0062]
[Effect of the Invention] Since a change of resolution is made in the combination of modification of a vertical-scanning rate, and modification of the storage time of an optoelectric transducer, it is not necessary to operate Rhine on a curtailed schedule like before, and while making unnecessary memory which stores reading Rhine, according to this invention, the good image with which image quality degradation does not break out can be obtained so that clearly from the above explanation. Moreover, since a vertical-scanning rate and the combination of the storage time can be chosen according to the property of devices, such as a drive system, the earliest reading rate can be offered in the resolution which could be equivalent to broad resolution and a broad scale factor, for example, was chosen.
[0063] Moreover, for every storage time of the optoelectric transducer to set up, by changing gain and an offset value, even if the storage times differ, a reading image without image quality change is obtained. Since the offset value is especially changed according to the storage time, it is effective in the ability to lose change of black level.

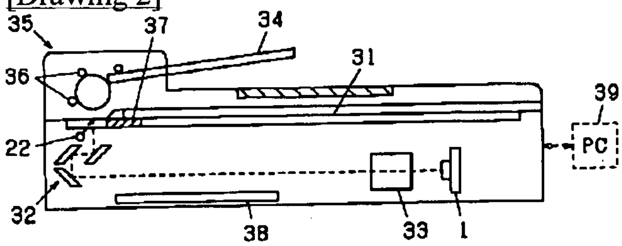
[Translation done.]

* NOTICES *

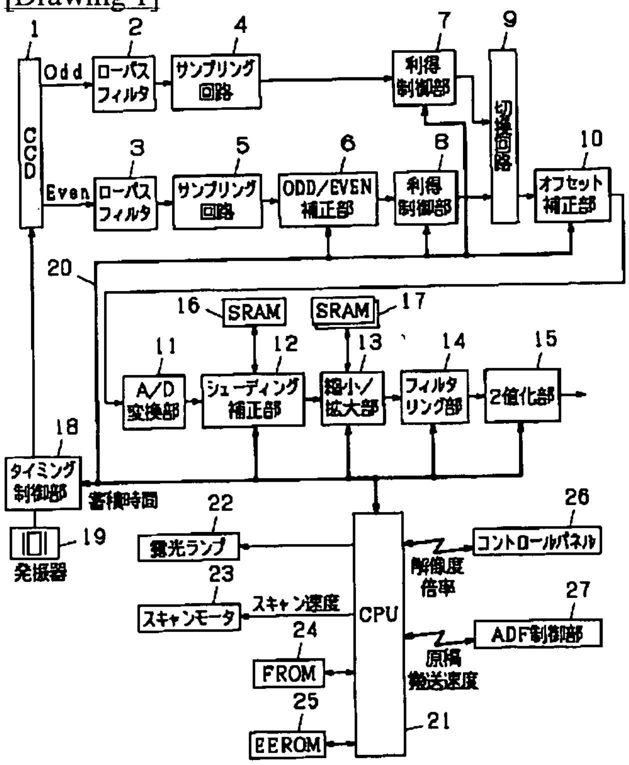
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 2]



[Drawing 1]



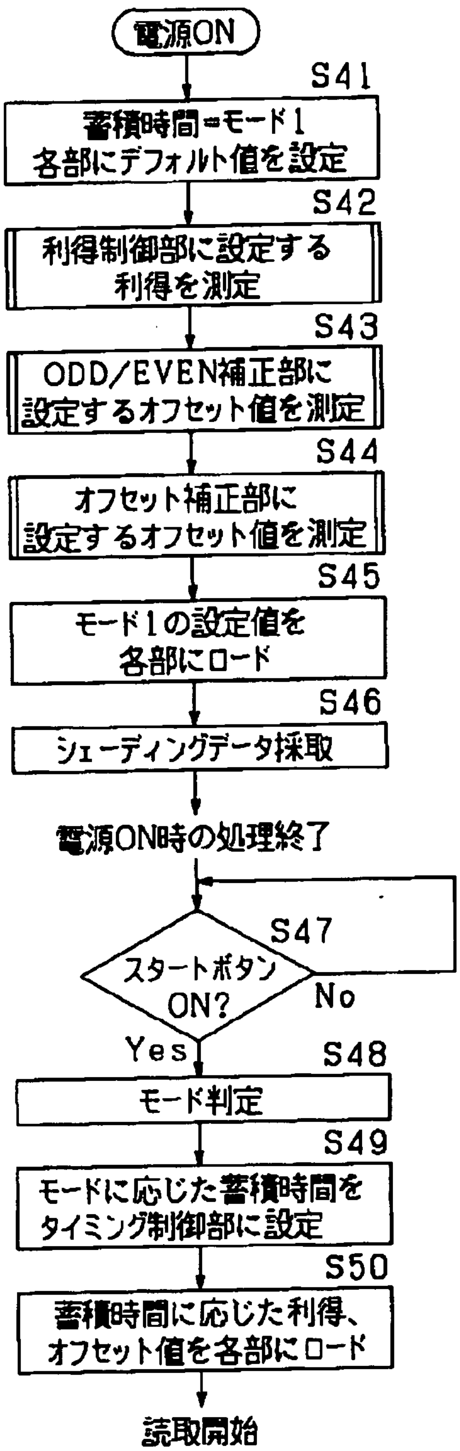
[Drawing 3]

モード	解像度(SPI)	設定倍率(%)	副走査速度	蓄積時間(μsec)	補間
1	600	25~400	設定倍率	244.70	無し
2	400	50~400	設定倍率	367.05	無し
3	200	50~400	設定倍率X2	367.05	無し
4	100	100~400	設定倍率X4	367.05	無し
5	100	50~99	設定倍率X2	734.10	無し
6	400	50~400	設定倍率	367.05	無し
7	200	100~400	設定倍率X2	367.05	無し
8	200	50~99	設定倍率	734.10	無し
9	100	200~400	設定倍率X4	367.05	無し
10	100	100~199	設定倍率X2	734.10	無し
11	100	50~99	設定倍率	1468.20	無し
12	600	50~141	設定倍率÷3	734.10	無し
13	400	50~400	設定倍率	367.05	無し
14	300	50~400	設定倍率	489.40	無し

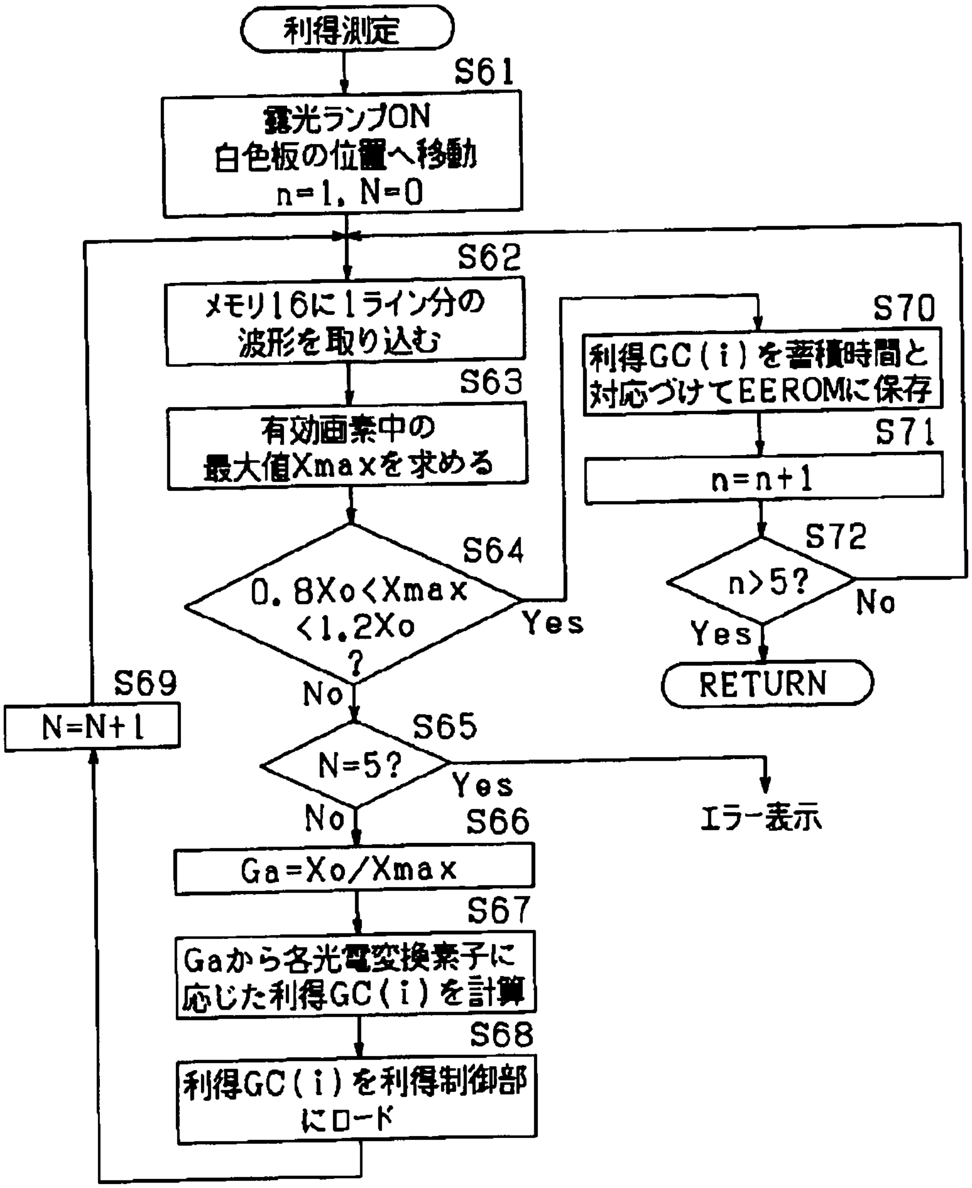
[Drawing 9]

モード	解像度(SPI)	設定倍率(%)	副走査速度	蓄積時間(μsec)	補間
2	400	50~400	設定倍率	466.9	無し
3	200	50~400	設定倍率X2	↑	無し
4	100	100~400	設定倍率X4	↑	無し
5	100	50~99	設定倍率X2	↑	2
6	400	50~400	設定倍率	↑	無し
7	200	100~400	設定倍率X2	↑	無し
8	200	50~99	設定倍率	↑	2
9	100	200~400	設定倍率X4	↑	無し
10	100	100~199	設定倍率X2	↑	2
11	100	50~99	設定倍率	↑	4

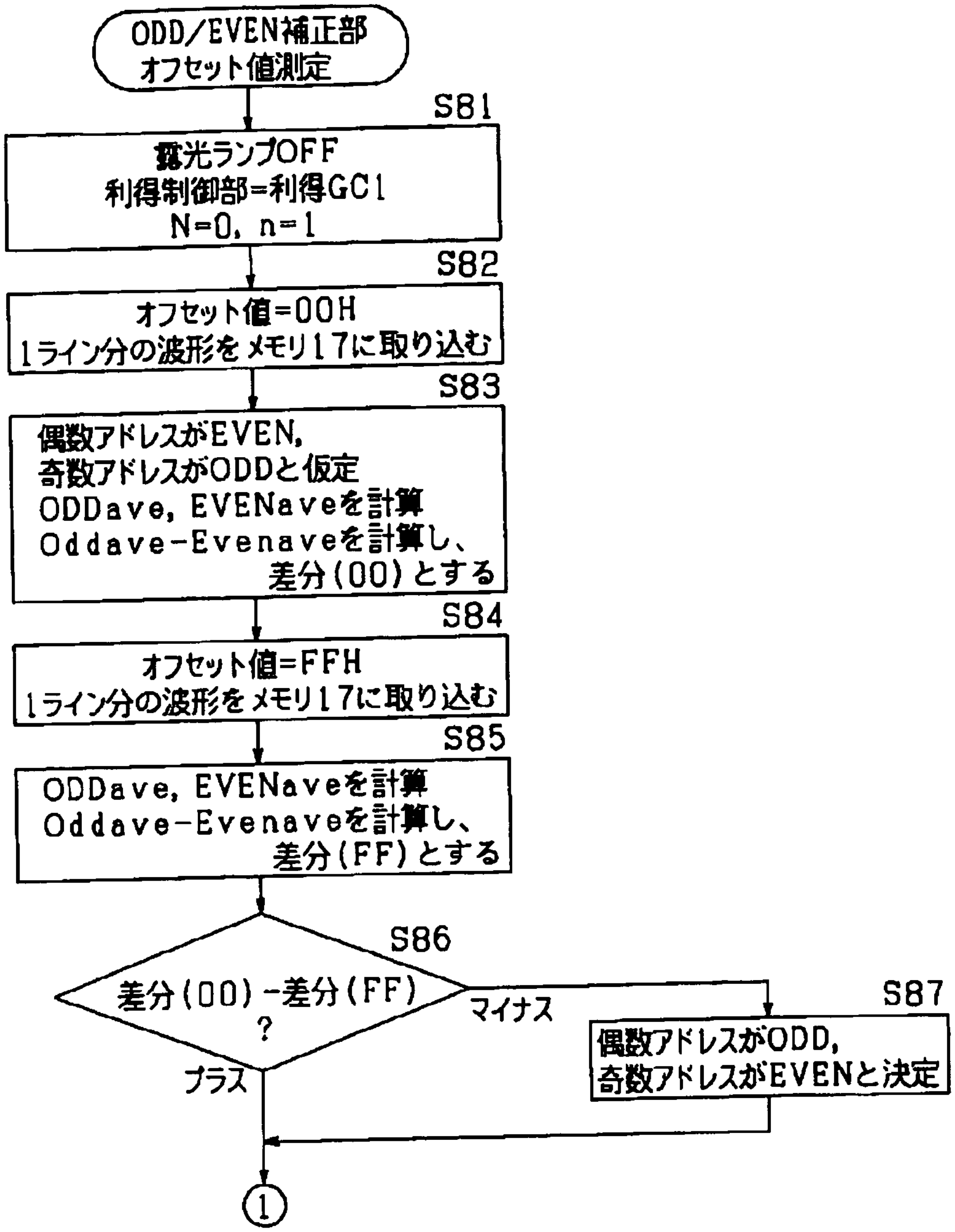
[Drawing 4]


電源ON
S41
蓄積時間=モード1
各部にデフォルト値を設定
S42
利得制御部に設定する
利得を測定
S43
ODD/EVEN補正部に
設定するオフセット値を測定
S44
オフセット補正部に
設定するオフセット値を測定
S45
モード1の設定値を
各部にロード
S46
シェーディングデータ採取
電源ON時の処理終了
S47
スタートボタン
ON?
No
Yes
S48
モード判定
S49
モードに応じた蓄積時間を
タイミング制御部に設定
S50
蓄積時間に応じた利得、
オフセット値を各部にロード
読取開始

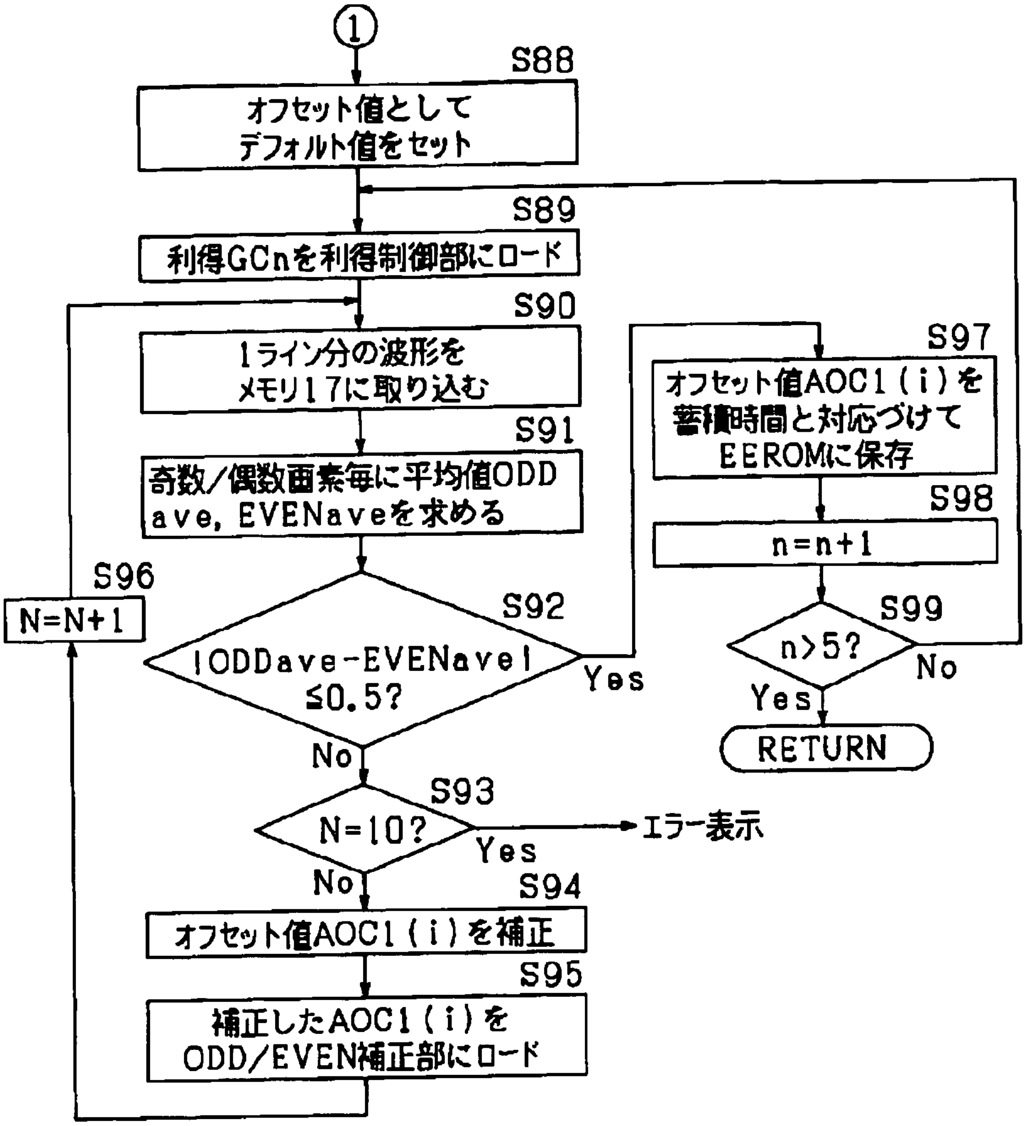
[Drawing 5]


利得測定
S61
露光ランプON
白色板の位置へ移動
n=1, N=0
S62
メモリ16に1ライン分の
波形を取り込む
S63
有効画素中の
最大値Xmaxを求める
S64
0.8Xo<Xmax
<1.2Xo
?
Yes
No
S65
N=5?
Yes
No
エラー表示
S66
Ga=Xo/Xmax
S67
Gaから各光電変換素子に
応じた利得GC(i)を計算
S68
利得GC(i)を利得制御部
にロード
S69
N=N+1
S70
利得GC(i)を蓄積時間と
対応づけてEEROMに保存
S71
n=n+1
S72
n>5?
No
Yes
RETURN

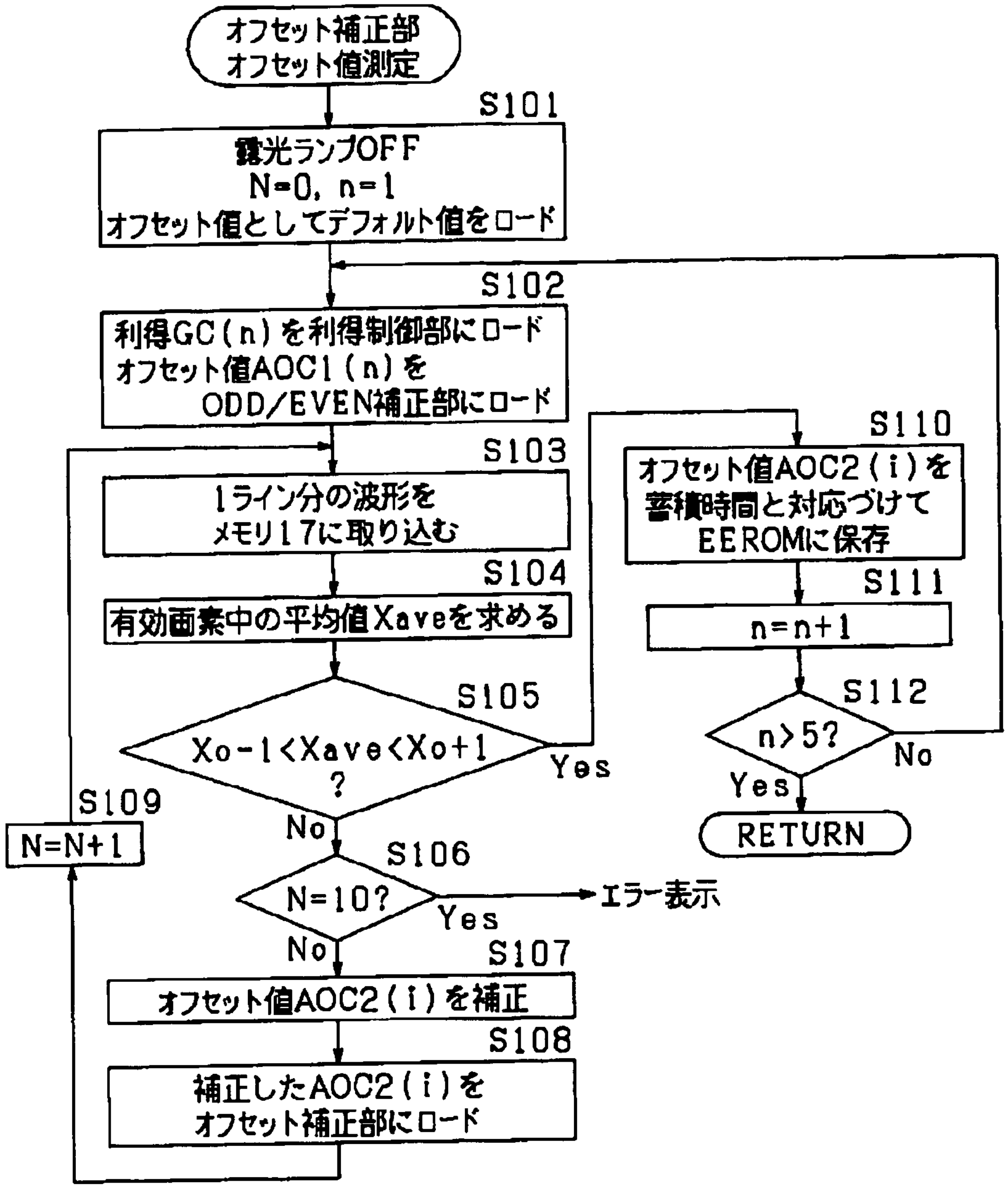
[Drawing 6]


ODD/EVEN補正部
オフセット値測定
S81
露光ランプOFF
利得制御部=利得GC1
N=0, n=1
S82
オフセット値=00H
1ライン分の波形をメモリ17に取り込む
S83
偶数アドレスがEVEN,
奇数アドレスがODDと仮定
ODDave, EVENaveを計算
Oddave-Evenaveを計算し、
差分(00)とする
S84
オフセット値=FFH
1ライン分の波形をメモリ17に取り込む
S85
ODDave, EVENaveを計算
Oddave-Evenaveを計算し、
差分(FF)とする
S86
差分(00)-差分(FF)
?
マイナス
S87
偶数アドレスがODD,
奇数アドレスがEVENと決定
プラス
1

[Drawing 7]


①
S88
オフセット値として
デフォルト値をセット
S89
利得GCnを利得制御部にロード
S90
1ライン分の波形を
メモリ17に取り込む
S91
奇数／偶数画素毎に平均値ODD
ave, EVENaveを求める
S92
|ODDave－EVENave|
≦0.5?
Yes
No
S93
N=10?
Yes
エラー表示
No
S94
オフセット値AOC1（i）を補正
S95
補正したAOC1（i）を
ODD／EVEN補正部にロード
S96
N=N+1
S97
オフセット値AOC1（i）を
蓄積時間と対応づけて
EEROMに保存
S98
n=n+1
S99
n>5?
No
Yes
RETURN

[Drawing 8]



[Translation done.]